IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:	Kurt Haller et al.
U.S. Serial No.:	10/678,883
Filing Date:	October 3, 2003
Title:	METHODS FOR CORRELATING BACKSIDE AND FRONTSIDE DEFECTS DETECTED ON A SPECIMEN AND CLASSIFICATION OF BACKSIDE DEFECTS
Group Art Unit:	2823
Examiner:	Hsien Ming Lee

I hereby certify that this correspondence is being transmitted electronically to the U.S. Patent and Trademark Office on the below date.

Emily Rhodes Date: October 31, 2007

APPEAL BRIEF

Sir/Madam:

Further to the Notice of Appeal filed April 2, 2007 and received in the Patent Office on April 2, 2007, Appellant presents this Appeal Brief. The Notice of Appeal was filed following mailing of a Final Office Action on January 4, 2007 and an Advisory Action on March 16, 2007 and with a Pre-Appeal Brief Request for Review. A Notice of Panel Decision from Pre-Appeal Brief Review mailed on May 24, 2007 indicates the Panel has determined that claims 1-3, 8, 10-16, and 19 stand rejected. This Appeal Brief is hereby filed within six months from the date of the mailing of the Notice of Panel Decision from Pre-Appeal Brief Review and with a petition for an extension of time for five months. Appellant hereby appeals to the Board of Patent Appeals and Interferences from a final rejection of claims 1-3, 8, 10-16, and 19 in the Final Office Action mailed January 4, 2007, and respectfully requests that this appeal be considered by the Board.

I. REAL PARTY IN INTEREST

The subject application is owned by KLA-Tencor Technologies Corp., a corporation having a place of business at One Technology Drive, Milpitas, California 95035, as evidenced by the assignment recorded at reel 014581, frame 0705.

II. RELATED APPEALS AND INTERFERENCES

No other prior and pending appeals, interferences, or judicial proceedings are known to Appellant or Assignee which would directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

Claim 22 was canceled. Claims 20-21 were allowed. Claims 4-7, 9, 17, and 18 were objected to. Claims 1-3, 8, 10-16, and 19 stand finally rejected. Claims 1-3, 8, 10-16, and 19 are being appealed.

IV. STATUS OF AMENDMENTS

No amendments to the claims have been filed subsequent to their final rejection. The Claims Appendix attached hereto reflects the current state of the claims.

V. SUMMARY OF CLAIMED SUBJECT MATTER

As recited in independent claim 1, Appellant's claimed invention relates to a computer-implemented method that includes determining if a portion of a backside defect (14, Fig. 1a) detected on a backside of a specimen is opposite to a portion of the frontside defect (12) detected on a frontside of the specimen. (Specification -- page 12, line 26 to page 13, line 8 and page 17, line 18 to page 19, line 17). The method also includes correlating the backside defect with the frontside defect if the portion of the backside defect is determined to be opposite to the portion of the frontside defect. (Specification -- page 14, line 22 to page 15, line 8 and page 16, line 20 to page 17, line 16).

In one embodiment, the method includes generating a single visual representation (24, Fig. 2) of the specimen that illustrates the backside defect and the frontside defect with different formatting to visually differentiate the backside defect and the frontside defect. (Specification -- page 19, line 19 to page 21, line 13). In another embodiment, the determining step includes comparing coordinates defining a location of the backside defect with coordinates defining a location of the frontside defect to determine if the portion of the backside defect on the backside of the specimen is opposite to the portion of the frontside defect on the frontside of the specimen. (Specification -- page 22, line 9 to page 23, line 22).

In one embodiment, the method includes classifying the backside defect. (Specification -- page 27, line 10 to page 28, line 20). In another embodiment, the method includes classifying the backside defect and determining a root cause of the backside defect from data representing processing history of the specimen. (Specification -- page 27, line 10 to page 28, line 20 and page 29, line 18 to page 30, line 19). In an additional embodiment, the method includes classifying the backside defect and determining parameters for classifying the frontside defect from the classification of the backside defect. (Specification -- page 27, line 10 to page 28, line 30). In a further embodiment, the method includes classifying the backside defect and determining a root cause of the frontside defect from the classification of the backside defect. (Specification -- page 27, line 10 to page 28, line 20 and page 31, lines 4-15).

In one embodiment, the method includes classifying the backside defect and altering a parameter of a process tool in response to the classification. In another embodiment, the method includes altering a parameter of a process tool in response to the backside defect to reduce occurrence of the frontside defect on additional specimen processed in the process tool. (Specification -- page 27, line 10 to page 28, line 20 and page 31, line 17 to page 33, line 18).

As recited in independent claim 16, Appellant's claimed invention also relates to a computer-implemented method that includes determining if a backside defect detected on a backside of a specimen and a frontside defect detected on a frontside of the specimen satisfy one or more proximity criteria. The method also includes correlating the backside defect with the frontside defect if the backside defect and the frontside defect satisfy the one or more proximity criteria. (Specification -- page 25, line 4 to page 27, line 8).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Claims 1-3, 8, 10-16, and 19 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,156,580 to Wooten et al. (hereinafter "Wooten").

VII. ARGUMENT

The contentions of Appellant with respect to each ground of rejection presented for review, and the basis therefore, with citations of the statutes, regulations, authorities, and parts of the record relied on are presented herein for consideration by the Board.

Rejection under 35 U.S.C. § 103(a) over Wooten

Claims 1, 2, 16, and 19

1. Wooten does not teach, suggest, or provide motivation for correlating a backside defect with a frontside defect if a portion of the backside defect is determined to be opposite to a portion of the frontside defect.

Independent claim 1 recites, in part: "correlating the backside defect with the frontside defect if the portion of the backside defect is determined to be opposite to the portion of the frontside defect." Independent claim 16 recites similar limitations.

Wooten discloses a semiconductor wafer analysis system and method. However, Wooten does not teach, suggest, or provide motivation for correlating a backside defect with a frontside defect if a portion of the backside defect is determined to be opposite to a portion of the frontside defect. The Final Office Action mailed January 4, 2007 (hereinafter "the Final Office Action") states:

> In re claim 1, Wooten et al. teach a computer-implemented method (col. 1, lines 47-48), comprising using laser to **inspect** both front-side defects and back-side defects of a wafer (col. 1, lines 55-60) and col. 5, lines 48-51); and downloading the front-side and back-side inspection data to a microscope review station 110 (col. 1, line 63 through col. 2, line 3 and col. 2, lines 14-23) to **review** the front-side defects and the back-side defects to **determine** if these defects present certain **coordination** (col. 4, lines 14-17 and col. 8, lines 36-52). (Final Office Action -- page 2, emphasis in original).

However, Wooten states that "the data may include the coordinates on the wafer at which reflected laser light having certain characteristics is detected. In an example embodiment, the characteristics are indicative of a defect. Thus, at laser inspection station 104, front side laser inspection data is gathered." (Wooten -- col. 3, lines 59-64). Therefore, Wooten teaches determining the coordinates of a front side defect on a front side of a wafer. Similarly, Wooten teaches determining the coordinates of a back side defect on a back side of a wafer. (*See*, for example, Wooten -- col. 2, lines 1-3).

However, Wooten does not teach or suggest using the coordinates of the front side defect and the back side defect to "determine if these defects present certain coordination" or for coordinating the front side and back side defects as suggested in the Final Office Action. Instead, Wooten simply teaches using the coordinates determined from inspection data to locate the defects in a defect review tool. For example, Wooten states that "if for a particular wafer the front side inspection data indicates that a defect may be present at a certain coordinate, it is desirable to visually review the defect area and judge whether the defect makes the wafer unusable." (Wooten -- col. 4, lines 14-19). In a similar manner, Wooten states that a method includes:

> selecting a wafer to analyze as a function of a predetermined reflected laser characteristic in the inspection data; moving the selected wafer to a microscope review station; downloading the front side inspection data of the selected wafer to the microscope review station; positioning the wafer via the wafer coordinates under the microscope at the defect positions indicated by the front side inspection data; inverting the wafer, whereby a back side of the wafer is exposed for review; downloading the back side inspection data to the microscope review station; and positioning the selected wafer via the wafer coordinates under the microscope at the defect positions indicated by the back side inspection data. (Wooten -- col. 8, lines 36-52).

Therefore, Wooten teaches using front side inspection data to position the front side of the wafer under the microscope at positions of front side defects on the front side of the wafer and using back side inspection data to position the back side of the wafer under the microscope at positions of back side defects on the back side of the wafer. However, Wooten does not teach or suggest using the front side inspection data and the back side inspection data to determine if front side and back side defects on a specimen "present certain coordination" as suggested in the Final Office Action.

More specifically, although Wooten teaches inspecting and reviewing front side and back side defects, Wooten does not teach, suggest, or provide motivation that inspection and review include correlating frontside and backside defects or that results of inspection and review can be used to determine a correlation between front side and back side defects. For example, Wooten states that "Front side inspection data is transmitted from the control system to the front side review station for the purpose of positioning the wafers under the microscope to view the defects." (Wooten -- col. 6, lines 21-24). Therefore, Wooten teaches using the front side inspection data to position front side defects in the field of view of the microscope review station. However, Wooten does not teach or suggest using the front side inspection data to determine if the front side defects are correlated to back side defects. Wooten also states that "wafers are selected for visual review. The selection may be made based on the reflected image of a laser scanned wafer possessing certain characteristics indicative of defects." (Wooten -- col. 6, lines 16-19). Therefore, Wooten teaches using results of the inspection of wafers to select wafers for visual review. However, Wooten does not teach or suggest using the results of the inspection of the wafers to determine if the front side defects are correlated to back side defects. In addition, Wooten states that "if for a particular wafer the front side inspection data indicates that a defect may be present at a certain coordinate, it is desirable to visually review the defect area and judge whether the defect makes the wafer unusable." (Wooten -- col. 4, lines 15-19). Therefore, Wooten teaches using results of review of front side defects to determine whether the defects render the wafer unusable. However, Wooten does not teach or suggest using results of inspection of the front side of the wafer or results of review of the front side defects to determine if the front side defects are correlated to back side defects. Wooten further states that "In-line inspection and review are important for determining whether wafers have become contaminated with particles due to a tool malfunction or process problem." (Wooten -- col. 1, lines 27-29). Therefore, Wooten teaches that the results of inspection and review can be used to determine whether wafers are contaminated with particles. However, Wooten does not teach or suggest using the results of the inspection and review to determine if front side defects are correlated to back side defects.

Wooten, therefore, discloses using results of inspection and review of wafers in a number of manners. However, Wooten does not teach or suggest that any of those uses include determining if front side defects are correlated to back side defects. In addition, Wooten discloses a number of reasons for performing inspection and review of wafers. However, Wooten does not teach or suggest that any of those reasons include determining if front side defects are correlated to back side defects. Therefore, Wooten does not teach, suggest, or provide motivation that inspection and review includes correlating front side and back side defects or that results of inspection and review can be used to determine a correlation between front side and back side defects.

Moreover, Wooten does not teach or suggest that defects on the front side and back side of a wafer are related in any manner or have any relationship to one another. Therefore, Wooten does not teach, suggest, or provide motivation for determining any relationship between front side and back side defects. As such, one of ordinary skill in the art would not be motivated by the teachings of Wooten to use the systems and methods taught by Wooten or any other system or method to find any relationship between front side and back side defects.

In addition, the coordinates for locations of front side defects on a front side of a wafer and back side defects on a back side of a wafer are determined by Wooten before and after a wafer has been inverted (or flipped over), respectively. (*See*, for example, Wooten -- col. 3, line 51 to col. 4, line 11). However, Wooten does not teach or suggest that inverting the wafer is or can be performed such that coordinates determined for locations opposite to each other on the front side and back side of the wafer are the same. As such, coordinates determined by the systems and methods of Wooten for locations opposite to each other on the front side and back side of the wafer will not be the same. Wooten also does not teach, suggest, or provide motivation for translating or altering the coordinates such that locations on the wafer that are opposite to one another on the front side and back side of the wafer are associated with the same coordinates. In addition, Wooten does not teach or suggest that the coordinates determined on one side of the wafer have any relationship to coordinates determined on the other side of the wafer. Wooten also does not teach, suggest, or provide motivation for any method or system for translating coordinates on one side of the wafer to coordinates determined on the other side of the wafer such that coordinates on one side of the wafer have a relationship to coordinates on the other side of the wafer. Therefore, although the coordinates of defect locations determined by the systems and methods taught by Wooten for defects detected on one side of the wafer may be used during defect review to find the defects on the same side of the wafer as disclosed by Wooten, such coordinates cannot be used to determine if front side and back side defects present certain coordination.

More specifically, without altering the coordinates of front side defects or back side defects determined by the methods and systems taught by Wooten, the inspection or review data generated by the methods and systems of Wooten cannot be used to correlate defects on different sides of the wafer. For example, as set forth in the Specification of the present application,

> As described above, for example, an inspection system will inspect a specimen from different sides of the specimen thereby resulting in images or image data of

> the different sides that have different, and in some instances opposite, coordinates along one axis of a two-dimensional rectangular coordinate system used to define spatial positions on the specimen. The images or image data of the different sides may also have coordinates that are different, or offset, from each other along both axes of the two-dimensional rectangular coordinate system. These differences may be caused by differences in alignment of a specimen prior to each inspection or if a coordinate system used to define locations on an unpatterned surface of the specimen is different than a coordinate system used to define locations on a patterned surface of a specimen. Therefore, the coordinates of one of the images or one set of image data may be altered to standardize the coordinates of both images or sets of image data. In some embodiments, the coordinates or both images of both sets of image data may be altered to standardize the coordinates. In either case, the method may determine if a defect is present on opposing sides of a specimen at the same position on a specimen as defined by the standardized coordinates. (Specification -- page 22, line 23 to page 23, line 8).

However, Wooten discloses no relationship between front side and back side defect coordinates and no system or method for altering the coordinates of front side defects or back side defects such that the inspection or review data can be used to correlate defects on different sides of a wafer based on their relative positions.

Accordingly, Wooten contains no teaching or suggestion that the presently claimed correlating step can be performed in any manner using the systems and methods taught by Wooten. In addition, Wooten provides no motivation for using the methods and systems taught by Wooten to perform the presently claimed correlating step. Therefore, contrary to the assertions in the Final Office Action, Wooten does not teach, suggest, or provide motivation for inspecting or reviewing front side defects and back side defects to determine if these defects present certain coordination.

For at least the reasons set forth above, Wooten does not teach, suggest, or provide motivation for correlating a backside defect with a frontside defect if a portion of the backside defect is determined to be opposite to a portion of the frontside defect, as recited in independent claims 1 and 16.

2. Even if correlating a back side defect with a front side defect can be interpreted as finding a mutual relation between front side defects and back side defects, Wooten does not teach, suggest, or provide motivation for finding such a mutual relation.

The Final Office Action states that "correlating the back-side defect with the front-side defect can be reasonably interpreted as finding a **mutual relation** between the front-side defects and the backside defects via reviewing the front-side and backside defects at a certain coordinate (col. 4, line 14-17)." (Final Office Action -- page 3, emphasis in original). However, even if "correlating the back-side defect with the front-side defect can be reasonably interpreted as finding a mutual relation between the front-side defects and the backside defects" as suggested in the Final Office Action, for at least the reasons set forth herein, Wooten does not teach, suggest, or provide motivation for attempting to find such a mutual relation in any manner. For example, Wooten does not teach, suggest, or provide motivation for attempting to find such a mutual relation by reviewing the front side and back side defects using the coordinates taught by Wooten.

3. One of ordinary skill in the art would not have been motivated by Wooten to attempt to find a mutual relation between front side defects and back side defects.

The Final Office Action states:

> Although Wooten et al. do not expressly teach correlating a back-side defect with a front-side defect detected a specimen, one of the ordinary skill in the art would have been motivated review the front-side and back-side defects at certain coordinates (col. 4, lines 14-17) to determine a qualitative and/or quantitative **mutual relation** between the front-side defect and the back-side defect. (Final Office Action -- pages 2-3, emphasis in original).

However, Wooten does not teach or suggest coordinating or correlating front side and back side defects, and the teachings of Wooten do not imply determining a qualitative and/or quantitative correspondence or relationship between the front side defects and the back side defects as suggested in the Final Office Action. In addition, based on the teachings of Wooten, one of ordinary skill in the art would not have been motivated to use the systems and methods taught by

Wooten to review front side and back side defects to determine a qualitative and/or quantitative mutual relation between the front side and back side defects. Consequently, one of ordinary skill in the art clearly would not have been motivated to use the systems and methods taught by Wooten to review the front side and back side defects at certain coordinates to determine a qualitative and/or quantitative mutual relation between front side defects and back side defects. Therefore, it would not have been obvious to one of ordinary skill in the art to try to use the systems and methods of Wooten to correlate a back side defect with a front side defect. In addition, for at least the reasons set forth above, one of ordinary skill in the art would not have been motivated to attempt to find a mutual relation between the front side defects and the back side defects by reviewing the front side and back side defects using the coordinates taught by Wooten.

The Advisory Action mailed March 16, 2007 (hereinafter "the Advisory Action") states that "one of the ordinary skill in the art would have motivated to use Wooten's method and system to arrive the claimed invention...because 'inspecting' would include a determination of any relationship between the front-side defects and the back-side defects, such as an alignment between the front-side defect pattern and the back-side defect pattern." (Advisory Action -- page 2). However, Wooten does not teach or suggest that "inspecting" includes determining a relationship between front side and back side defects. For example, Wooten states:

> In an example scenario, an operator loads a cassette of wafers into the inspection station 104. In an example embodiment, the laser inspection station is an argon ion laser scanner such as the A17 station that is available from KLA Tencor. One-by-one, either all or selected ones of the wafers in the cassette are removed from the cassette, staged for laser scanning, and laser scanned. Laser scan data for the wafers are returned to the control system 102 or another suitable defect database. For example, the data may include the coordinates on the wafer at which reflected laser light having certain characteristics is detected. In an example embodiment, the characteristics are indicative of a defect. Thus, at laser inspection station 104, front side laser inspection data is gathered. After laser scanning the front sides of the wafers, the cassette is moved to second laser inspection station 106. The laser inspection station 106 is configured with the wafer inverter 114, whereby the wafers are flipped in order to collect laser scan data for the back sides of the wafers. Operation of and processing by the laser inspection station 106 is similar to that of laser inspection station 104. However,

> before a wafer is staged and laser scanned, the wafer inverter flips the wafer to expose its back side for laser scanning. The laser inspection station transmits back side inspection data to the manufacturing control system 102. After the wafers have been processed by laser inspection stations 104 and 106, the manufacturing control system 102 has received both front side and back side inspection data for the wafers. (Wooten -- col. 3, line 51 to col. 4, line 12).

Therefore, the teachings of Wooten do not teach or suggest that inspection of the wafer includes determining a relationship between front side and back side defects. In addition, inspecting as taught by Wooten does not include determining any relationship between front side defects and back side defects much less a relationship such as an alignment between a front side defect pattern and a back side defect pattern. Wooten also does not teach, suggest, or provide motivation for aligning a front side defect pattern and a back side defect pattern. In addition, Wooten does not teach, suggest, or provide motivation for altering the coordinates of front side defects and/or back side defects such that locations on the wafer that are opposite to one another are associated with the same or corresponding coordinates and/or such that front side and back side defect patterns can be aligned to one another.

4. One of ordinary skill in the art would not be able to perform the claimed correlating using the methods and systems taught by Wooten.

The Final Office Action states:

> In response to the foregoing arguments, Wooten teach inspecting frontside defects and backside defects at the same laser scanning station (col. 4, lines 39-43 and col. 5, lines 53-56) and thus reviewing both frontside defects and backside defects on the same microscope review station (col. 4, lines 43-45 and col. 5, lines 56-58). The revealed defects are present at a certain coordinate (col. 4, lines 15-17). When both frontside defects and backside defects are present at the certain coordinates at the microscope review station, one of the ordinary skill in the art would readily appreciate any correlation between the frontsdie defects and the backside defects based on any defect pattern located at the certain coordinates. For example, the front side of the specimen has circular-shaped black spots (i.e. the frontside defects) located at the same coordinates as the backside of the specimen which has also similar black-spot defect pattern. In other word, by reviewing the frontside defects and the backside defects at the same microscope review station, the ordinary skilled in the art would be able to correlate the frontside defects and the backside defects based on the defect patterns located at

> corresponding coordinates on the frontside and the backside of the specimen. (Final Office Action -- page 7).

This position is erroneous for a number of reasons. First, as set forth in detail above, Wooten teaches that even if defects on the front side and the back side of a wafer are reviewed in the same station, the wafer is inverted between review of the defects on the front side of the wafer and review of the defects on the back side of the wafer. Therefore, an area on the front side of a wafer in the field of view of the microscope review station during review of defects on the front side of the wafer when the wafer is in a first position with respect to the field of view of the microscope review station will not be opposite an area of the wafer in the field of view of the microscope review station during review of defects on the backside of the wafer when the wafer is in the same position with respect to the field of view of the microscope review station. In addition, based on the absence of any teaching or suggestion in Wooten as to any correspondence or relationship between coordinates of defects on the front side of the wafer and coordinates of defects on the back side of the wafer, it is impossible for one of ordinary skill in the art to determine or predict where the area on the front side of the wafer will be with respect to the field of view of the microscope review station after the wafer has been inverted.

Second, the Examiner asserts that one of ordinary skill in the art would "appreciate" any correlation between defects on different sides of the wafer based on any defect pattern located at certain coordinates. However, Wooten does not teach or suggest generating any such defect pattern. In particular, Wooten does not teach or suggest that the front side of the specimen has circular-shaped black spots or that the back side of the specimen has a black spot defect pattern. More specifically, Wooten does not teach or suggest that the defects on either the front side of the wafer or the back side of the wafer appear in either the inspection or the microscope review station as "black spots." In addition, as is known by one of ordinary skill in the art, defects on a wafer do not inherently appear as "black spots" on the wafer. Instead, some defects appear brighter than the surrounding background and therefore would appear as bright spots. Therefore, the defects detected by Wooten do not inherently appear on the wafer in either the inspection system or the microscope review station as "black spots." In addition, although Wooten teaches that the inspection station may capture a reflected image of a laser scanned wafer and that the reflected image may be used to select wafers for review (*See*, for example, Wooten -- col. 6, lines 16-19 and 25-29), Wooten does not teach or suggest that the reflected images of the front side of the wafer and the back side of the wafer can be compared or that the same locations in the reflected images correspond to locations on the front side of the wafer and the back side of the wafer that are opposite to each other or correlate to one another. In other words, one cannot simply display the reflected images of the back side and front side of the wafer or overlay the reflected images of the back side and front side of the wafer (neither of which Wooten teaches or suggests) to determine that circular-shaped black spots or black-spot defect patterns at the same positions in the reflected images of the front side and back side of the wafer are correlated because using the systems and methods of Wooten one cannot determine which portions of the images correspond to locations on the wafer that are opposite to each other. In addition, using the systems and methods of Wooten, one cannot determine how to align the reflected images of the back side and front side of the wafer such that locations opposite to each other on the front side and back side of the wafer correspond to the same coordinates in both reflected images and can therefore be compared as suggested in the Final Office Action. In this manner, if one of ordinary skill in the art were to compare the reflected images of the back side and front side of the wafer generated by the systems of Wooten as suggested in the Final Office Action, one could not determine if black spots or black-spot defect patterns that appear at the same locations in the reflected images correspond to defects that are located opposite to each other on the back side and front side of the wafer. Therefore, one of ordinary skill in the art would not be able to correlate defects that are opposite to each other on the front side and back side of the wafer using such reflected images. As such, based on the teachings of Wooten, one of ordinary skill in the art would not be able to "appreciate" any correlation between defects on different sides of the wafer based on any defect pattern located at certain coordinates.

Third, as set forth in detail above, the coordinates on the front side and the back side of the wafer taught by Wooten do not have any correspondence to each other. Therefore, one of ordinary skill in the art would not be able to determine which defect patterns are located at corresponding locations on the front side and the back side of the wafer using the coordinates determined by Wooten. As such, by reviewing the front side defects and the back side defects at the same microscope review station, one of ordinary skill in the art would not be able to perform the claimed correlating step. In addition, since the coordinates on the front side and the back side of the wafer taught by Wooten do not have any correspondence to each other, one of ordinary skill in the art would not be able to determine which coordinates correspond to locations opposite to each other on the front side and the back side of the wafer. As such, one of ordinary skill in the art would not be able to knowingly review front side and back side defects located opposite to each other using the coordinates taught by Wooten. As a result, one of ordinary skill in the art would not be able to determine a correlation between the front side and back side defects by reviewing the defects using the coordinates taught by Wooten.

The Advisory Action states:

> Even though the coordinates for locations of frontside and backside defects are determined before and after the wafer is inverted, it still would be able to determine a mutual relation between frontside and backside defects because all information of inspecting frontside and backside defects are stored in the microscope review station. One of the ordinary skill in the art would have readily to retrive the inspecting information to determine the mutual relation between frontside defects and backside defects. (Advisory Action -- page 2).

However, Wooten does not teach or suggest that the coordinates determined on one side of the wafer have any relationship to coordinates determined on the other side of the wafer. For example, coordinates determined by the systems and methods of Wooten for locations opposite to each other on the front side and back side of the wafer will not be the same because the coordinates for locations of front side and back side defects are determined before and after a wafer has been inverted (or flipped over). Wooten also does not teach or suggest that inverting the wafer is or can be performed such that coordinates determined for locations opposite to each other on the front side and back side of the wafer are the same or have any correspondence. Therefore, such coordinates cannot be used to determine a mutual relation between front side and back side defects. In this manner, one of ordinary skill in the art would not be able to determine "the mutual relation" between front side and back side defects by simply retrieving such coordinates stored in a review station as suggested in the Advisory Action.

The Advisory Action also states that "one of the ordinary skill would have readily comprehend that the explanations set forth above and in the Final rejection would be able to determine correlation between the frontside defects and the backside defects. After all, finding the correlation can be done by reviewing the frontside defects and the backside defects at certain corresponding coordinates." (Advisory Action -- page 2). However, as set forth in detail above, using the systems and methods of Wooten, one of ordinary skill in the art cannot determine if review performed for a front side defect and a back side defect is performed at certain corresponding coordinates or locations on the front side and back side of the wafer that are opposite to each other. Therefore, regardless of how one of ordinary skill in the art would comprehend the explanations set forth in the Advisory Action and the Final Office Action, the fact remains that by using the systems and methods of Wooten to review front side defects and back side defects, one of ordinary skill in the art would not be able to determine which front side defects are located opposite to which back side defects and therefore would not be able to correlate a back side defect with a front side defect if a portion of the back side defect is opposite to a portion of the front side defect.

5. There is no teaching, suggestion, or motivation for a reasonable expectation of success that the systems and methods of Wooten can be used as suggested by the Examiner.

The Advisory Action states that "one of the ordinary skill in the art would have motivated to use Wooten's method and system to arrive the claimed invention for a reasonable expectation of success, i.e. inspecting the front-side and back-side defects (col. 8, lines 36-52) to determine the mutual relation or correlation between the front-side defect and the back-side defect." (Advisory Action -- page 2). Wooten, however, contains no teaching or suggestion that the presently claimed correlating step can be performed using the systems and methods taught by Wooten. In addition, Wooten provides no motivation for using the methods and systems taught by Wooten to perform the presently claimed correlating step. Consequently, one of ordinary skill in the art clearly would not have been motivated to use the systems and methods taught by Wooten to inspect or review front side and back side defects at certain coordinates to determine any mutual relation between the front side and back side defects.

Moreover, as set forth in detail above, the systems and methods of Wooten are unable to perform the claimed correlating step, and one of ordinary skill in the art would be unable to perform the claimed correlating step using the systems and methods of Wooten. In addition, the systems and methods of Wooten are inherently unable to perform the claimed correlating step. Therefore, the systems and methods of Wooten would have to be modified such that the systems and methods could be used to perform the claimed correlating step. However, the prior art provides no teaching or suggestion of how or if the systems and methods of Wooten could be modified such that they could be used to perform the claimed correlating step. Therefore, the prior art provides no reasonable expectation of success that the systems and methods of Wooten could be modified such that they could be used to perform the claimed correlating step. As such, Wooten does not teach, suggest, or provide motivation for a reasonable expectation of success that the systems and methods of Wooten can be used to determine any mutual relation or correlation between front side and back side defects. More specifically, Wooten does not teach, suggest, or provide motivation for a reasonable expectation of success that the systems and methods of Wooten can be used to determine "a qualitative and/or quantitative mutual relation between the front-side defect and the back-side defect" as suggested in the Final Office Action. The prior art can be modified or combined to reject claims as *prima facie* obvious as long as there is a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). MPEP 2143.02. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). MPEP 2143. Therefore, Wooten cannot be used to reject the present claims as *prima facie* obvious.

6. Even if one of ordinary skill in the art would be able to modify the systems and methods taught by Wooten to meet the claimed invention, that fact alone is not sufficient to establish *prima facie* obviousness.

The Examiner appears to suggest that one of ordinary skill in the art would be able to perform the claimed method by using the systems taught by Wooten. However, even if the claimed invention is within the capabilities of one of ordinary skill in the art (or if one of ordinary skill in the art would be able to perform the claimed invention based on the teachings of the prior art), that fact is not sufficient by itself to establish *prima facie* obviousness. In addition, for at least the reasons set forth above, the reference relied upon does not teach all aspects of the claimed invention. Furthermore, the cited art fails to establish some objective reason to modify the teachings of Wooten (e.g., since the cited art does not teach or suggest that front side defects and back side defects have any relationship to each other). As such, even if one of ordinary skill in the art would be able to modify the systems and methods of Wooten to perform the claimed correlating step, that fact alone is not sufficient to establish *prima facie* obviousness. Therefore, the assertions made by the Examiner in the Final Office Action and the Advisory Action are not sufficient to establish a *prima facie* case of obviousness. A statement that modifications of the prior art to meet the claimed invention would have been "'well within the ordinary skill of the art at the time the claimed invention was made'" because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. *Ex Parte Levengood,* 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993). MPEP 2143.01. (emphasis in original).

7. It would not have been obvious to try to modify the systems and methods of Wooten such that they can perform the claimed correlating step.

The systems and methods of Wooten are inherently incapable of performing the claimed correlating step. Therefore, the systems and methods of Wooten would have to be modified such that the systems and methods could be used to perform the claimed correlating step. However, there is no reasonable expectation of success of how or if the systems and methods of Wooten can be modified such that they can perform or be used to perform the claimed correlating step. In particular, the cited art provides no teaching, suggestion, or guidance as to how or if the systems and methods of Wooten can be modified such that they can perform or be used to perform the claimed correlating step. Moreover, the cited art does not identify any known potential solutions that could have been used with a reasonable expectation of success to modify the systems and methods of Wooten such that they can perform or be used to perform the claimed correlating step. As such, the cited art does not provide a finite number of identified, predictable solutions, with a reasonable expectation of success from which one of ordinary skill in the art could have chosen to modify the systems and methods of Wooten such that they can perform or be used to perform the claimed correlating step. In this manner, the Examiner has not articulated "a finding that one of ordinary skill in the art could have pursued the known potential solutions with a reasonable expectation of success." MPEP 2143. The rationale to support a conclusion that the claim would have been obvious is that "a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely that product [was] not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show that it was obvious under § 103." *KSR*, 550 U.S. at ___, 82 USPQ2d at 1397. If any of these findings cannot be made, then this rationale cannot be used to support a conclusion that the claim would have been obvious to one of ordinary skill in the art. MPEP 2143. As such, it would not have been obvious to one of ordinary skill in the art to try to modify the systems and methods of Wooten such that they can perform or be used to perform the claimed correlating. Therefore, an obvious to try rationale cannot be used to support a conclusion that the present claims would have been obvious to one of ordinary skill in the art.

8. Even if the systems and methods taught by Wooten can be modified, that fact alone is not sufficient to establish *prima facie* obviousness.

The Advisory Action states:

> In this regard, Wooten et al suggest that "the present invention should not be considered limited to the particular example described above, but rather should be understood to cover all aspecs of the invention as fairly set out in the attached claims" and various modifications, equivalent processes to which the teachings may be applicable would have readily apparent to the ordinary skill in the art (col. 7, lines 15-22, Wooten). In other word, the teachings of Wooten is illustrative rather than restrictive. (Advisory Action -- page 2).

The Examiner is correct that the teachings of Wooten are illustrative rather than restrictive. Nevertheless, the systems and methods of Wooten cannot be modified in any manner unless there is a suggestion or motivation to do so. Obviousness cannot be established by combining or modifying the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion or incentive to do so. *In re Bond,* 910 F.2d 81, 834, 15 USPQ2d 1566, 1568 (Fed. Cir. 1990). For at least the reasons set forth above, there is no teaching, suggestion, or motivation to modify the systems and methods of Wooten as suggested in the Final Office Action and the Advisory Action to arrive at the presently claimed computer-implemented methods.

The Final Office Action also states:

> After all, Wooten's teachings are illustrative rather than restrictive. One of the ordinary skill in the art should not be limited to the particular example taught in the patent (col. 7, lines 15-18, Wooten). Rather, to correlate the frontside defects and the backside defects based on the inspection data present on the same microscope review station is readily apparent to those skill in the art upon review of Wooten's entire teachings (col. 7, lines 19-23). (Final Office Action -- page 7).

However, the arguments presented herein are not based on a restrictive interpretation of the teachings of Wooten. In addition, the arguments presented herein are not based on a limited review of only a portion of the teachings of Wooten. In particular, upon review of the entire teachings of Wooten, Wooten clearly does not explicitly, implicitly, or otherwise teach, suggest, or provide motivation for correlating front side defects with back side defects. In particular, upon review of the entire teachings of Wooten, it is clear to one of ordinary skill in the art that Wooten contains no teaching, suggestion, or motivation for correlating the front side defects and the back side defects based on inspection data present on the same microscope review station. Therefore, contrary to the assertions of the Examiner, it would not have been readily apparent to those of ordinary skill in the art upon review of Wooten's entire teaching to correlate front side defects and back side defects based on the inspection data present on the same microscope review station.

9. Since the prior art is silent with regard to correlating frontside and backside defects, it appears that impermissible hindsight has been used to reject the present claims as obvious.

The teachings of Wooten do not contain explicitly, implicitly, or otherwise any teaching, suggestion, or motivation to correlate front side defects and back side defects. In addition, the teachings of Wooten do not contain explicitly, implicitly, or otherwise any teaching, suggestion, or motivation to attempt to use the systems and methods of Wooten to correlate front side defects and back side defects. Furthermore, the teachings of Wooten do not contain explicitly, implicitly, or otherwise any teaching, suggestion, or motivation as to how or if the systems and methods of Wooten can be modified such that they can be used to correlate front side defects and back side defects. Consequently, since Wooten is completely and absolutely silent with regard to correlating front side and back side defects, one having knowledge which was within the level of ordinary skill in the art at the time the claimed invention was made would not have been motivated to use the systems and methods of Wooten to perform the claimed correlating.

As such, the only teaching, suggestion, motivation, and reasonable expectation of success for correlating frontside defects and backside defects can be found in Appellant's disclosure. Therefore, it appears that the Examiner is relying on Appellant's disclosure to read the asserted teachings, suggestions, motivations, and reasonable expectations of success into the teachings of Wooten. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). MPEP 2143. Impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art. MPEP 2142. Applicants may argue that the examiner's conclusion of obviousness is based on improper hindsight reasoning. However, "[a]ny judgement on obviousness is in a sense necessarily a reconstruction based on hindsight reasoning, but so long as it takes into account only knowledge which was within the level of ordinary skill in the art at the time the claimed invention was made and does not include knowledge gleaned only from applicant's disclosure, such a reconstruction is proper." *In re McLaughlin*, 443 F.2d 1392, 1395, 170 USPQ 209, 212 (CCPA 1971). MPEP 2145.

10. The Examiner has failed to establish a *prima facie* case of obviousness.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all claim limitations. MPEP § 2143. These three criteria have not been met in the present case. For example, in this case, none of the three criteria required to establish a *prima facie* case of obvious has been met, as explained above in Arguments 1-9. Therefore, a *prima facie* case of obviousness has not been established.

Conclusion

As explained in the above arguments, the prior art reference does not teach or suggest all limitations of claims 1 and 16. For at least these reasons, claims 1 and 16 are patentably distinct over the cited art. Claim 2 is dependent from claim 1 and is, therefore, also patentably distinct over the cited art for at least the same reasons. Claim 19 is dependent from claim 16 and is, therefore, also patentably distinct over the cited art for at least the same reasons. The rejection of claims 1, 2, 16, and 19 under 35 U.S.C. § 103 is, therefore, asserted to be erroneous.

Claim 3

Because claim 3 is dependent from claim 1, the arguments presented above for patentability of claim 1 apply equally to claim 3, and are herein incorporated by reference. Claim 3 further recites that the claimed method includes generating a single visual representation of the specimen that illustrates the backside defect and the frontside defect with different formatting to visually differentiate the backside defect and the frontside defect. These additional recitations make claim 3 separately patentable over the cited art, as described in more detail below.

The cited art does not teach, suggest, or provide motivation for generating a single visual representation of a specimen that illustrates a backside defect and a frontside defect with different formatting to visually differentiate the backside defect and the frontside defect.

Wooten discloses generating a "reflected image of a laser scanned wafer" and a "reflected image of the back side of a wafer when subjected to laser scanning." (Wooten -- col. 6, lines 16-

19 and lines 26-29). As such, Wooten discloses generating two different reflected images, one for the front side of the wafer and one for the back side of the wafer. However, Wooten does not teach, suggest, or provide motivation for generating any other visual representation of the wafer. Therefore, Wooten does not teach, suggest, or provide motivation for generating a single visual representation of a specimen that illustrates a back side defect and a front side defect with different formatting to visually differentiate the back side defect and the front side defect.

The Final Office Action states:

> Wooten et al. teach generating a single visual representation of the specimen by transmitting the inspection defect data to the microscope review station 108 and 110 (Fig. 1) and to a control computer (col. 9, lines 6-7 and 13-14) to generate a visual representation for visual review (e.g. download inspection data to microscope station for visual review, col. 9, lines 21-22, 31-32 and col. 10, lines 56-57). (Final Office Action -- page 3).

However, merely transmitting inspection defect data to a microscope review station and to a control computer for visual review does not include generating a single visual representation of a specimen that illustrates a backside defect and a frontside defect with different formatting to visually differentiate the backside defect and the frontside defect. In addition, results of inspection and review performed by the systems and methods taught by Wooten do not inherently include a single visual representation of a specimen that illustrates a backside defect and a frontside defect with different formatting to visually differentiate the backside defect and the frontside defect. For example, review of defects on the frontside and backside of the wafer does not inherently include generating a single visual representation of the wafer that illustrates a backside defect and a frontside defect with different formatting to visually differentiate the backside defect and the frontside defect.

Conclusion

As explained in the above arguments, the prior art reference does not teach or suggest all limitations of claim 3. Claim 3 is therefore patentably distinct over the cited art, and rejection of claim 3 under 35 U.S.C. § 103 is asserted to be erroneous.

Claim 8

Because claim 8 is dependent from claim 1, the arguments presented above for patentability of claim 1 apply equally to claim 8, and are herein incorporated by reference. Claim 8 further recites that determining if a portion of a backside defect detected on a backside of a specimen is opposite to a portion of a frontside defect detected on a frontside of the specimen includes comparing coordinates defining a location of the backside defect with coordinates defining a location of the frontside defect. These additional recitations make claim 8 separately patentable over the cited art, as described in more detail below.

The cited art does not teach, suggest, or provide motivation for determining if a portion of a backside defect detected on a backside of a specimen is opposite to a portion of a frontside defect detected on a frontside of the specimen by comparing coordinates defining a location of the backside defect with coordinates defining a location of the frontside defect.

Wooten states that "The microscope review station 108, in response to the front side inspection data, positions the wafer under the microscope to permit viewing of the defect. Without the coordinates, the operator would be left having to manually position the wafer for viewing the defect." (Wooten -- col. 4, lines 21-25). Wooten also states that "The back side inspection data is transmitted from the control system 102 to the review station 110, and the review station positions each wafer under the microscope in response to the back side inspection data." (Wooten -- col. 4, lines 35-38). Therefore, Wooten discloses using coordinates in front side inspection data to position defects on the front side of the wafer in the field of view of a microscope review station and using coordinates in back side inspection data to position defects on the back side of the wafer in the field of view of a microscope review station. However, Wooten does not teach, suggest, or provide motivation for comparing coordinates defining a location of a backside defect with coordinates defining a location of a frontside defect. As such, Wooten does not teach, suggest, or provide motivation for determining if a portion of a backside defect detected on a backside of a specimen is opposite to a portion of a frontside defect detected on a frontside of the specimen by comparing coordinates defining a location of the backside defect with coordinates defining a location of the frontside defect.

The Final Office Action states that "In re claims 8 and 10, Wooten et al. teach the claimed limitations because by **reviewing** the front-side defects and the back-side defects to **determine** if these defects present certain **coordination** (col. 4, lines 14-17 and col. 8, lines 36-52), one of the ordinary skilled in the art would be able to determine if a portion of the back-side defect is opposite to a portion of the front-side defect." (Final Office Action -- pages 3-4, emphasis in original). However, for at least the reasons set forth in the arguments presented above for patentability of claim 1, reviewing front side defects and back side defects as taught by Wooten does not include determining if front side defects and back side defects present certain coordination or are correlated to each other. In addition, for at least the reasons set forth in the arguments presented above for patentability of claim 1, results of reviewing front side defects and back side defects as taught by Wooten cannot be used to determine if front side defects and back side defects present certain coordination or are correlated to each other. Moreover, for at least the reasons set forth in the arguments presented above for patentability of claim 1, one of ordinary skill in the art would not be able to determine if a portion of a back side defect is opposite to a portion of a front side defect by reviewing the front side and back side defects as taught by Wooten. Therefore, the basis for the Examiner's rejection of claim 8 is incorrect.

Conclusion

As explained in the above arguments, the prior art reference does not teach or suggest all limitations of claim 8. Claim 8 is therefore patentably distinct over the cited art, and rejection of claim 8 under 35 U.S.C. § 103 is asserted to be erroneous.

Claim 10

Because claim 10 is dependent from claim 1, the arguments presented above for patentability of claim 1 apply equally to claim 10, and are herein incorporated by reference. Claim 10 further recites that the claimed method includes classifying the backside defect. These additional recitations make claim 10 separately patentable over the cited art, as described in more detail below.

The cited art does not teach or suggest classifying backside defects.

Wooten states that "it is desirable to provide a system and method that is better able to detect contamination and defects, as well as provide for improved review of wafers." (Wooten -- col. 1, lines 40-42). Therefore, Wooten discloses detecting contamination and defects. Wooten also states that "it is desirable to visually review the defect area and judge whether the defect makes the wafer unusable." (Wooten -- col. 4, lines 17-19). Therefore, Wooten discloses using results of defect review to determine whether defects make a wafer unusable. However, Wooten does not teach or suggest that determining whether defects make a wafer unusable as taught by Wooten includes defect classification. For instance, although Wooten discloses detecting contamination and defects, Wooten does not teach or suggest using results of review to classify the defects as contamination or other defects and does not teach or suggest that determining whether defects make a wafer unusable includes classifying the defects as contamination or other defects. In addition, Wooten states that "FIG. 4 shows the relationship between FIGS. 4A and 4B, which together comprise a flowchart of a process for analyzing wafers according to various example embodiments of the invention." (Wooten -- col. 5, lines 44-47). However, Wooten does not teach or suggest that analyzing wafers includes defect classification. As such, Wooten does not teach or suggest classifying backside defects.

The Final Office Action states:

> In re claims 8 and 10, Wooten et al. teach the claimed limitations because by **reviewing** the front-side defects and the back-side defects to **determine** if these defects present certain **coordination** (col. 4, lines 14-17 and col. 8, lines 36-52),

> one of the ordinary skilled in the art would be able…to classify the defects, e.g. to see if the defect patterns are point-defect or line-defect or irregular shape defects via the microscope view station as taught by Wooten et al. (Final Office Action -- pages 3-4, emphasis in original).

However, Wooten contains no teaching or suggestion that one of ordinary skill in the art would be able to classify defects as suggested in the Final Office Action. In particular, Wooten does not teach or suggest that one of ordinary skill in the art can use the microscope review station to see or determine if there are defect patterns or if the defect patterns are point defects, line defects, or irregular shaped defects. In addition, as is known to one of ordinary skill in the art, simply determining if defects are point defects, line defects, or irregular shaped defects does not inherently include classifying the defects. For example, two defects that have irregular shapes may have different classifications. In a similar manner, defects that are point defects may have different classifications, and defects that are line defects may have different classifications. Therefore, simply determining that a defect has a particular shape does not inherently include classifying a defect. Therefore, the basis for the Examiner's rejection of claim 10 is incorrect.

Conclusion

As explained in the above arguments, the prior art reference does not teach or suggest all limitations of claim 10. Claim 10 is therefore patentably distinct over the cited art, and rejection of claim 10 under 35 U.S.C. § 103 is asserted to be erroneous.

Claim 11

Because claim 11 is dependent from claim 1, the arguments presented above for patentability of claim 1 apply equally to claim 11, and are herein incorporated by reference. Claim 11 further recites that the claimed method includes classifying the backside defect and determining a root cause of the backside defect from data representing processing history of the specimen. These additional recitations make claim 11 separately patentable over the cited art, as described in more detail below.

The cited art does not teach or suggest classifying a backside defect and determining a root cause of the backside defect from data representing processing history of a specimen.

Wooten states that "In-line inspection and review are important for determining whether wafers have become contaminated with particles due to a tool malfunction or process problem." (Wooten -- col. 1, lines 27-29). Therefore, Wooten discloses that defects on wafers may have causes such as a tool malfunction or process problem. However, Wooten does not teach or suggest that the processing history of a specimen is available to the systems and methods of Wooten or can be accessed or acquired by the systems and methods of Wooten. In addition, Wooten does not teach or suggest that the processing history of a specimen can be used by the systems and methods of Wooten in any manner whatsoever. Furthermore, although Wooten teaches that defects can have different causes (e.g., a tool malfunction or process problem), Wooten does not teach or suggest determining a root cause of defects detected on the wafer. Therefore, Wooten does not teach or suggest determining a root cause of a backside defect from data representing processing history of a specimen.

The Final Office Action states:

> In e claims 11 and 13, one of the ordinary skill in the art would have been motivated to use Wooten's teachings to classify the defects, as stated in the rejection against claims 8 and 10, and further to determine a root cause of the back-side defect (e.g., unwanted debris or contaminants) from data representing process history of the specimen while the microscope view station as taught by Wooten et al. obviously is capable of classifying and analyzing the defect data. (Final Office Action -- page 4, emphasis in original).

However, as set forth in the arguments presented above for patentability of claim 10, Wooten does not teach or suggest that the microscope review station is capable of classifying defects. In addition, Wooten does not teach or suggest that analysis of the defects that may be performed by the systems and methods of Wooten includes classifying the defects or determining a root cause of the defects. Furthermore, since Wooten does not teach or suggest that the systems and methods of Wooten are configured for or capable of classifying defects or determining a root cause of defects and does not teach or suggest that the systems and methods of Wooten can access, acquire, or use process history of a specimen, one of ordinary skill in the art would not have been motivated to attempt to use the systems and methods of Wooten to determine a root cause of a back side defect from data representing process history of the specimen. Therefore, the basis for the Examiner's rejection of claim 11 is incorrect.

Conclusion

As explained in the above arguments, the prior art reference does not teach or suggest all limitations of claim 11. Claim 11 is therefore patentably distinct over the cited art, and rejection of claim 11 under 35 U.S.C. § 103 is asserted to be erroneous.

Claim 12

Because claim 12 is dependent from claim 1, the arguments presented above for patentability of claim 1 apply equally to claim 12, and are herein incorporated by reference. Claim 12 further recites that the claimed method includes classifying the backside defect and determining parameters for classifying the frontside defect from the classification of the backside defect. These additional recitations make claim 12 separately patentable over the cited art, as described in more detail below.

The cited art does not teach or suggest classifying a backside defect and determining parameters for classifying a frontside defect from the classification of the backside defect.

The Final Office Action states:

> In re claim 12, one of the ordinary skill in the art would have been motivated to use Wooten's teachings to classify the defects, as stated in the rejection against claims 8 and 10, and to determine parameters for the classifying because analyzing and categorizing the defect pattern as taught by Wooten would include classifying the defects and determining parameters for the classifying. (Final Office Action -- page 4, emphasis in original).

However, as set forth in the arguments presented above for patentability of claim 10, Wooten does not teach or suggest classifying backside defects. In addition, Wooten does not teach or suggest classifying frontside defects. For example, Wooten states that "if for a particular wafer the front side inspection data indicates that a defect may be present at a certain coordinate, it is desirable to visually review the defect area and judge whether the defect makes the wafer unusable." (Wooten -- col. 4, lines 15-19). Therefore, Wooten discloses using results of defect review to determine whether defects make a wafer unusable. However, Wooten does not teach or suggest that determining whether defects make a wafer unusable as taught by Wooten includes defect classification. For instance, Wooten does not teach or suggest that results of review can be used to classify the defects as contamination or other defects and does not teach or suggest that determining whether defects make a wafer unusable includes classifying the defects as contamination or other defects. Wooten also states that "The illustrated embodiment is believed to be beneficial in arrangements already having conventional inspection and review stations for analyzing the front sides of wafers." (Wooten -- col. 4, lines 45-48). Therefore, Wooten teaches analyzing the front sides of wafers. However, Wooten does not teach or suggest that analyzing the front sides of wafers includes classifying defects on the front sides of wafers. In addition, Wooten states that "FIG. 4 shows the relationship between FIGS. 4A and 4B, which together comprise a flowchart of a process for analyzing wafers according to various example embodiments of the invention." (Wooten -- col. 5, lines 44-47). However, Wooten does not teach or suggest that analyzing wafers in the process of Fig. 4 includes defect classification. As such, Wooten does not teach or suggest classifying front side defects. Moreover, Wooten is completely silent with regard to classifying front side defects. Therefore, Wooten cannot teach or suggest determining parameters for classifying a frontside defect from the classification of a backside defect.

For at least the reasons set forth above, therefore, one of ordinary skill in the art would not have been motivated to use Wooten's teachings to classify defects. In addition, Wooten does not teach or suggest that analyzing defects includes classifying defects and determining parameters for classifying defects. Furthermore, Wooten does not teach or suggest "categorizing a defect pattern." Therefore, contrary to the assertions in the Final Office Action, one of ordinary skill in the art would not have been motivated to use Wooten's teachings to determine parameters for classifying defects. For at least the reasons set forth above, therefore, Wooten does not teach or suggest classifying a backside defect and determining parameters for classifying a frontside defect from the classification of the backside defect. Therefore, the basis for the Examiner's rejection of claim 12 is incorrect.

Conclusion

As explained in the above arguments, the prior art reference does not teach or suggest all limitations of claim 12. Claim 12 is therefore patentably distinct over the cited art, and rejection of claim 12 under 35 U.S.C. § 103 is asserted to be erroneous.

Claim 13

Because claim 13 is dependent from claim 1, the arguments presented above for patentability of claim 1 apply equally to claim 13, and are herein incorporated by reference. Claim 13 further recites that the claimed method includes classifying the backside defect and determining a root cause of the frontside defect from the classification of the backside defect. These additional recitations make claim 13 separately patentable over the cited art, as described in more detail below.

The cited art does not teach or suggest classifying a backside defect and determining a root cause of a frontside defect from the classification of the backside defect.

The Final Office Action states:

> In e claims 11 and 13, one of the ordinary skill in the art would have been motivated to use Wooten's teachings to classify the defects, as stated in the rejection against claims 8 and 10, and further to determine a root cause of the back-side defect (e.g., unwanted debris or contaminants)...while the microscope view station as taught by Wooten et al. obviously is capable of classifying and analyzing the defect data. (Final Office Action -- page 4, emphasis in original).

However, as set forth in the arguments presented above for patentability of claim 10, Wooten does not teach or suggest classifying backside defects. In addition, Wooten does not teach or suggest determining a root cause of frontside defects. For example, Wooten states that "In-line inspection and review are important for determining whether wafers have become contaminated with particles due to a tool malfunction or process problem." (Wooten -- col. 1, lines 27-29). Therefore, Wooten discloses that defects on wafers may have causes such as a tool malfunction or process problem. However, although Wooten teaches that defects can have different causes (e.g., a tool malfunction or process problem), Wooten does not teach or suggest determining a root cause of defects detected on the wafer. For example, Wooten states that "if for a particular wafer the front side inspection data indicates that a defect may be present at a certain coordinate, it is desirable to visually review the defect area and judge whether the defect makes the wafer unusable." (Wooten -- col. 4, lines 15-19). Therefore, Wooten discloses using results of defect review to determine whether defects make a wafer unusable. However, Wooten does not teach or suggest that determining whether defects make a wafer unusable as taught by Wooten includes determining a root cause of the defects. For instance, Wooten does not teach or suggest that results of review can be used to determine a root cause of the defects and does not teach or suggest that determining whether defects make a wafer unusable includes determining a root cause of the defects. Wooten also states that "The illustrated embodiment is believed to be beneficial in arrangements already having conventional inspection and review stations for analyzing the front sides of wafers." (Wooten -- col. 4, lines 45-48). Therefore, Wooten teaches analyzing the front sides of wafers. However, Wooten does not teach or suggest that analyzing the front sides of wafers includes determining a root cause of defects on the front sides of wafers. In addition, Wooten states that "FIG. 4 shows the relationship between FIGS. 4A and 4B, which together comprise a flowchart of a process for analyzing wafers according to various example embodiments of the invention." (Wooten -- col. 5, lines 44-47). However, Wooten does not teach or suggest that analyzing wafers in the process shown in Fig. 4 includes determining a root cause of defects. As such, Wooten does not teach or suggest determining a root cause of defects. Therefore, Wooten cannot teach or suggest determining a root cause of a frontside defect from the classification of a backside defect.

Contrary to the assertions in the Final Office Action, therefore, one of ordinary skill in the art would not have been motivated to use Wooten's teachings to determine a root cause of defects because Wooten does not teach or suggest that the microscope review station as taught by Wooten is capable of determining a root cause of defects. In addition, contrary to the assertions in the Final Office Action, one of ordinary skill in the art would not have been motivated to use Wooten's teachings to determine a root cause of defects because Wooten does not teach or suggest that analyzing defect data includes determining a root cause of defects. Therefore, the basis for the Examiner's rejection of claim 13 is incorrect.

Conclusion

As explained in the above arguments, the prior art reference does not teach or suggest all limitations of claim 13. Claim 13 is therefore patentably distinct over the cited art, and rejection of claim 13 under 35 U.S.C. § 103 is asserted to be erroneous.

Claim 14

Because claim 14 is dependent from claim 1, the arguments presented above for patentability of claim 1 apply equally to claim 14, and are herein incorporated by reference. Claim 14 further recites that the claimed method includes classifying the backside defect and altering a parameter of a process tool in response to the classification. These additional recitations make claim 14 separately patentable over the cited art, as described in more detail below.

The cited art does not teach or suggest classifying a backside defect and altering a parameter of a process tool in response to the classification.

The Final Office Action states:

> In re claims 14 and 15, one of the ordinary skill in the art would have been motivated to use Wooten's teachings to classify the back-side defect and to alter a parameter of a process tool in response to the classification...since Wooten

> teaches analyzing and categorizing the defect pattern and altering the parameter of a process tool, such as the position of wafer inverters 114 and 116 in the microscope review station 110. (Final Office Action -- page 4, emphasis in original).

However, as set forth in the arguments presented above for patentability of claim 10, Wooten does not teach or suggest classifying backside defects. In addition, Wooten does not teach or suggest altering a parameter of a process tool in response to classification of a backside defect. For example, the Examiner contends that the parameter of the process tool that is altered by Wooten is the position of the wafer inverters. However, Wooten states that "After laser scanning the front sides of the wafers, the cassette is moved to second laser inspection station 106. The laser inspection station 106 is configured with the wafer inverter 114, whereby the wafers are flipped in order to collect laser scan data for the back sides of the wafers." (Wooten -- col. 3, line 65 to col. 4, line 2). Wooten also states that "Having laser scanned the back side of the wafer, the wafer is again flipped to return the wafer to having its front side exposed (upwards, for example) and replaced in the cassette." (Wooten -- col. 6, lines 6-9). Therefore, Wooten teaches altering the position of the wafer inverters based on whether inspection of one side of the wafer has been completed. In addition, Wooten states that "For wafers that are acceptable after having reviewed the front sides, visual inspection of the back sides of the wafers is desirable to review the back side defects...Each wafer selected for visual review and prior to being staged under the microscope of station 110, is flipped by wafer inverter 116 in order to expose the back side of the wafer to the microscope." (Wooten -- col. 4, lines 28-35). Therefore, Wooten discloses altering the position of the wafer inverter if the front sides of the wafers are acceptable and if it is desirable to review the back side defects. However, Wooten does not teach or suggest altering a position of the wafer inverters based on a classification of a back side defect. As such, Wooten does not teach or suggest classifying a backside defect and altering a parameter of a process tool in response to the classification.

Contrary to the assertions in the Final Office Action, therefore, one of ordinary skill in the art would not have been motivated to use Wooten's teachings to alter a parameter of a process tool in response to the classification of a backside defect. Therefore, the basis for the Examiner's rejection of claim 14 is incorrect.

Conclusion

As explained in the above arguments, the prior art reference does not teach or suggest all limitations of claim 14. Claim 14 is therefore patentably distinct over the cited art, and rejection of claim 14 under 35 U.S.C. § 103 is asserted to be erroneous.

Claim 15

Because claim 15 is dependent from claim 1, the arguments presented above for patentability of claim 1 apply equally to claim 15, and are herein incorporated by reference. Claim 15 further recites that the claimed method includes altering a parameter of a process tool in response to the backside defect to reduce occurrence of the frontside defect on additional specimen processed in the process tool. These additional recitations make claim 15 separately patentable over the cited art, as described in more detail below.

The cited art does not teach or suggest altering a parameter of a process tool in response to a backside defect to reduce occurrence of a frontside defect on additional specimen processed in the process tool.

The Final Office Action states:

> In re claims 14 and 15, one of the ordinary skill in the art would have been motivated to use Wooten's teachings to classify the back-side defect and to alter a parameter of a process tool...in response to the back-side defect to reduce occurrence of the front-side defect on additional specimen since Wooten teaches analyzing and categorizing the defect pattern and altering the parameter of a process tool, such as the position of wafer inverters 114 and 116 in the microscope review station 110. By analyzing and categorizing the defects and altering the positions of the wafer inverters it would lead to reduce occurrence of the front-side defect. (Final Office Action -- page 4, emphasis in original).

However, as is known to one of ordinary skill in the art, analyzing and categorizing defects and altering positions of wafer inverters in an inspection and/or defect review tool cannot reduce occurrence of frontside defects. In particular, some other action would be required (e.g., altering a parameter of a process tool used to fabricate wafers) to reduce occurrence of frontside defects. Therefore, contrary to the assertions in the Final Office Action, analyzing and categorizing defects and altering the position of the wafer inverters would not lead to reduced occurrence of front side defects. In addition, Wooten does not teach or suggest performing any such action based on any of the results produced by the inspection and review systems and methods described by Wooten. For example, Wooten states that "Because contamination can cause stepper hot spots or further contamination of process tools, it is desirable to detect contamination before it creates further problems." (Wooten -- col. 1, lines 36-39). Therefore, Wooten teaches detecting contamination before it creates further problems. However, Wooten does not teach or suggest altering a parameter of a process tool to reduce contamination on additional specimens processed in the process tool. In addition, Wooten does not teach or suggest that the inspection and review systems and methods of Wooten are capable of performing any action that would reduce occurrence of front side defects. As such, Wooten does not teach or suggest altering a parameter of a process tool in response to a backside defect to reduce occurrence of a frontside defect on additional specimen processed in the process tool.

Contrary to the assertions in the Final Office Action, therefore, one of ordinary skill in the art would not have been motivated to use Wooten's teachings to alter a parameter of a process tool to reduce occurrence of frontside defects on additional specimen processed in the process tool. Therefore, the basis for the Examiner's rejection of claim 15 is incorrect.

Conclusion

As explained in the above arguments, the prior art reference does not teach or suggest all limitations of claim 15. Claim 15 is therefore patentably distinct over the cited art, and rejection of claim 15 under 35 U.S.C. § 103 is asserted to be erroneous.

CONCLUSION

For the foregoing reasons, it is submitted that the Examiner's rejection of claims 1-3, 8, 10-16, and 19 was erroneous, and reversal of the Examiner's decision is respectfully requested.

The Commissioner is authorized to charge any fees which may be required or credit any overpayment to deposit account number 02-0393.

Respectfully submitted,

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VIII. CLAIMS APPENDIX

The present claims on appeal are as follows.

1. A computer-implemented method, comprising:

determining if a portion of a backside defect detected on a backside of a specimen is opposite to a portion of the frontside defect detected on a frontside of the specimen; and

correlating the backside defect with the frontside defect if the portion of the backside defect is determined to be opposite to the portion of the frontside defect.

2. The method of claim 1, wherein the portion of the backside defect is aligned with the portion of the frontside defect along an axis perpendicular to the frontside and the backside of the specimen.

3. The method of claim 1, further comprising generating a single visual representation of the specimen that illustrates the backside defect and the frontside defect with different formatting to visually differentiate the backside defect and the frontside defect.

4. The method of claim 1, further comprising identifying data representative of a signature of a chuck of a process tool within data generated during detection of the backside defect and removing the data representative of the signature of the chuck from the data generated during detection of the backside defect prior to said correlating.

5. The method of claim 1, further comprising generating visual representations of the frontside and the backside of the specimen, altering one of the visual representations such that the altered visual representation appears as a mirror image of the one visual representation, and superimposing the altered and the unaltered visual representations to generate an overall visual representation of the specimen.

6. The method of claim 5, wherein said determining comprises determining if the portion of the backside defect on the backside of the specimen is opposite to the portion of the frontside defect on the frontside of the specimen from the overall visual representation.

7. The method of claim 5, wherein the overall visual representation does not illustrate additional backside defects detected on the specimen and additional frontside defects detected on the specimen, and wherein the additional backside defects are not correlated with the additional frontside defects.

8. The method of claim 1, wherein said determining comprises comparing coordinates defining a location of the backside defect with coordinates defining a location of the frontside defect to determine if the portion of the backside defect on the backside of the specimen is opposite to the portion of the frontside defect on the frontside of the specimen.

9. The method of claim 8, further comprising altering the coordinates defining the location of the backside defect or the coordinates defining the location of the frontside defect prior to said comparing such that the locations of the backside defect and the frontside defect are defined as if the frontside and backside defects were detected on the same side of the specimen.

10. The method of claim 1, further comprising classifying the backside defect.

11. The method of claim 1, further comprising classifying the backside defect and determining a root cause of the backside defect from data representing processing history of the specimen.

12. The method of claim 1, further comprising classifying the backside defect and determining parameters for classifying the frontside defect from the classification of the backside defect.

13. The method of claim 1, further comprising classifying the backside defect and determining a root cause of the frontside defect from the classification of the backside defect.

14. The method of claim 1, further comprising classifying the backside defect and altering a parameter of a process tool in response to the classification.

15. The method of claim 1, further comprising altering a parameter of a process tool in response to the backside defect to reduce occurrence of the frontside defect on additional specimen processed in the process tool.

16. A computer-implemented method, comprising:

determining if a backside defect detected on a backside of a specimen and a frontside defect detected on a frontside of the specimen satisfy one or more proximity criteria; and

correlating the backside defect with the frontside defect if the backside defect and the frontside defect satisfy the one or more proximity criteria.

17. The method of claim 16, further comprising defining the backside defect as a geometrical figure having lateral dimensions larger than the backside defect, wherein the one or more proximity criteria are satisfied if at least a portion of the geometrical figure is opposite to at least a portion of the frontside defect.

18. The method of claim 16, further comprising defining the frontside defect as a geometrical figure having lateral dimensions larger than the frontside defect, wherein the one or more proximity criteria are satisfied if at least a portion of the geometrical figure is opposite to at least a portion of the backside defect.

19. The method of claim 16, wherein the one or more proximity criteria are satisfied if at least a portion of the backside defect is opposite to at least a portion of the frontside defect.

20. A computer-implemented method, comprising:

analyzing data representing spatial characteristics of backside defects detected on a specimen to classify the backside defects;

determining if data generated during detection of the backside defects is representative of a signature of a chuck of a process tool;

removing the data representative of the chuck from data generated during detection of the backside defects;

determining if a portion of one of the backside defects detected on a backside of the specimen is opposite to a portion of a frontside defect detected on a frontside of the specimen; and

correlating the one of the backside defects with the frontside defect if the portion of the one of the backside defects is determined to be opposite to the portion of the frontside defect.

21. The method of claim 20, wherein said analyzing comprises spatial signature analysis of the data.

IX. EVIDENCE APPENDIX

none

X. RELATED PROCEEDINGS APPENDIX

none